

Electrochemical-Driven Fluid Pump for Spacecraft Thermal Control, Phase I

Completed Technology Project (2007 - 2007)



Project Introduction

With the increasing power demands and longer life spans of space vehicles, their thermal management becomes ever more critical. Accompanying this is an unprecedented need for reduction in spacecraft size and weight. However, reduced weight leads to higher power densities, and waste-heat dissipation densities have grown by an order of magnitude with the use of smaller, more powerful electronics. Active thermal control methods are needed to cope with the increasing heat dissipation requirements and environmental extremes. In recent years, spacecraft have employed mechanically pumped fluid loops to efficiently transfer large amounts of thermal energy between two points by means of a forced liquid convention loop. The development of long-life fluid pumps, however, has not kept pace with the demands of advanced thermal control systems. Conventional electric motor-driven fluid pumps are heavy, bulky, inefficient, and prone to wear. Lynntech proposes to extend the operating temperature range of its long-life, low-power, miniature, electrochemically-driven pumps to -60

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- C to 110
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- C, which will allow their use in space and planetary environmental extremes.

Anticipated Benefits

With the increasing power density of electronics, there is a growing market for miniature, low-power pumps for use in the thermal management of consumer electronics. In particular, the interest in a low-cost, lightweight, quiet, efficient liquid pump for laptop cooling is high. A rugged, long life, low power, miniature pump capable of operating in extreme environments will have applications in the advance thermal control systems that will be required in future robotic missions and spacecraft.



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

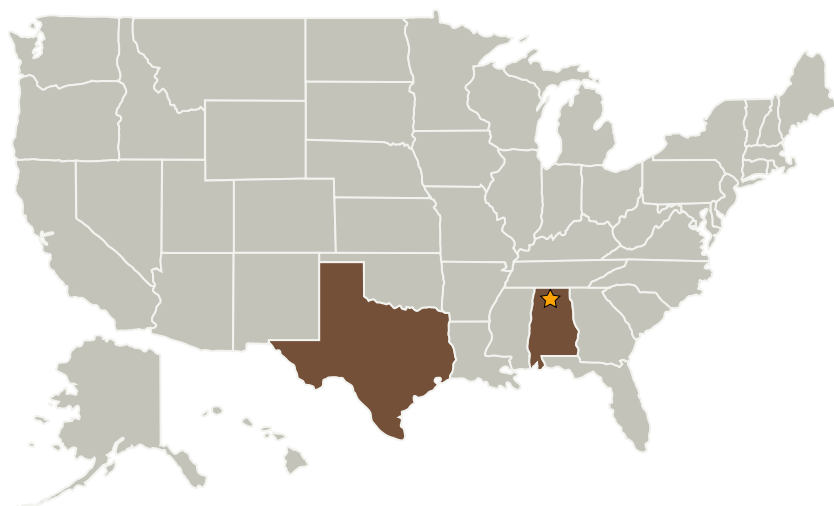
Small Business Innovation Research/Small Business Tech Transfer

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Marshall Space Flight Center (MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Lynntech, Inc.	Supporting Organization	Industry	College Station, Texas

Primary U.S. Work Locations

Alabama	Texas
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Manager:

Jeff Farmer

Principal Investigator:

Roger Van Boeyen

Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.2 Thermal Control Components and Systems
 - └ TX14.2.3 Heat Rejection and Storage